Data Concentrator for Modular and Distributed Control of Propulsion Systems

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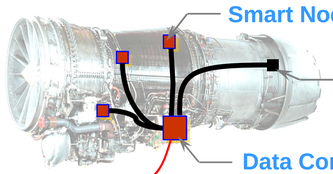
Description

Under funding from NASA and the Department of Defense, Orbital Research Inc. is developing ***high temperature electronic (HTE) components*** that will enable *Distributed Full Authority Digital Engine Control* (FADEC) in turbine engines. HTE components permit control modules to be placed on the engine in hot zones near sensors and actuators, thus enabling distributed engine control (offloading of FADEC functionality), which holds many associated benefits.

Benefits

- Enables replacement of the large bundles of noise sensitive analog cable interfaces between sensors/actuators and the FADEC with a digital data bus, thus reducing weight.
- Optimized actuator performance through closed-loop control.
- Lower maintenance costs through CBM and PHM capabilities.
- Lower costs for FADEC upgrades.



Distributed Engine Control

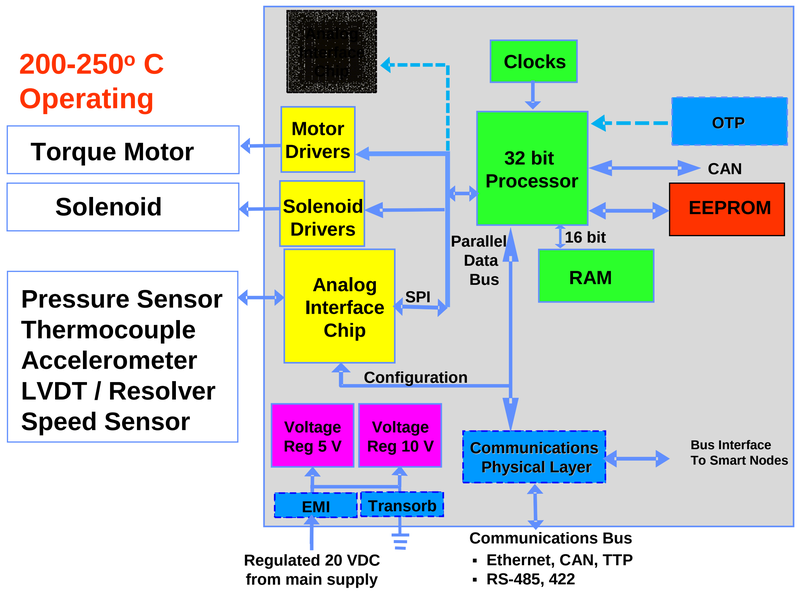
Approach

Orbital Research Inc. is developing high temperature electronic components needed to generate a temperature-tolerant Data Concentrator and associated Smart Nodes for use on turbine engines. "High Temperature" in this case is 220 – 250ºC continuous operation. Electronics are developed on silicon-on-insulator wafer technology. The Data Concentrator is a critical control module performing a variety of control functions, located on a turbine engine.

High temperature components in a Data Concentrator include interface circuits for actuators and sensors (required for network nodes that are not "Smart"), a processor, and program storage to provide fault isolation and prognostic health management for all nodes on the network for which it must provide an interface.

Each Smart Node provides a sensor or actuator interface and a communication channel to the Data Concentrator.

Each of the components shown below (with the exception of the EEPROM) are under development at Orbital as high temperature ASICs for use in Data Concentrators and Smart Nodes.

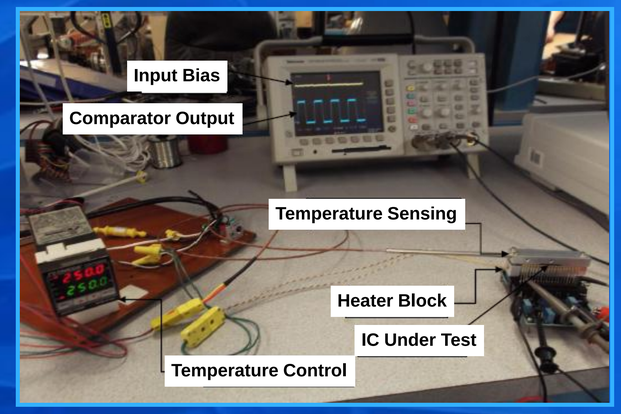


Data Concentrator Module

Recent Results

Design and layout of several new high temperature ASICs are nearing completion. They are due to go to the foundry for fabrication 10/31/13.

- One time Programmable ROM
- UART with RS-485 line driver
- Switching Voltage Regulator
- Transient Voltage Suppressor
- New and improved Comparator, Op Amp, and DAC



Future Work

Submit Files to Fabrication Facility.

Design and build test fixtures for all the new ASICs that are being developed. These will require high temperature packages, substrates, and connections.

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